CLAIMS

1. A position detection apparatus that detects the position of a moving object, said position detection apparatus comprising:

an image acquisition device that acquires an image of the forward field of view of said moving object,

a distance image acquisition device having the same field of view as said image acquisition device that acquires a distance image simultaneous to acquisition of an image by said image acquisition device,

a characteristic point extraction device that extracts respective characteristic points from the images of at least two consecutive frames, and

a reference characteristic point selection device that calculates the amount of displacement of a position between two frames of a characteristic point extracted by said characteristic point extraction device based on said distance image, and selects a reference characteristic point for calculating position according to said amount of displacement.

2. A position detection apparatus that detects the position of a moving object, said position detection apparatus comprising:

an image acquisition device that acquires an image within the forward field of view of said moving object,

a reference point determination device that determines a reference characteristic point to serve as a reference during movement of said moving object based on an image obtained from said image acquisition device, and

a position detection device that detects position by substituting self-movement

control and the observed amount of said reference point into an extended Kalman filter.

3. A position detection apparatus that detects the position of a moving object, said position detection apparatus comprising:

an image acquisition device that acquires an image of the forward field of view of said moving object,

a distance image acquisition device having the same field of view as said image acquisition device that acquires a distance image simultaneous to acquisition of an image by said image acquisition device,

a characteristic point extraction device that extracts respective characteristic points from obtained images, and

a reference characteristic point selection device that compares pre-stored object information with extracted characteristic points, and considers those characteristic points having a high correlation to be known characteristic points that are used as reference characteristic points for calculating position.

4. The position detection apparatus according to claim 3 wherein, said characteristic point selection device updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

5. A position detection apparatus that detects the position of a moving object, said position detection apparatus comprising:

an image acquisition device that acquires an image of the forward field of view of

said moving object,

a characteristic point group extraction device that extracts a characteristic point group in said image, and

a position detection device that calculates position by correlating and storing multiple characteristic point groups in an image pre-obtained with said image acquisition device with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.

6. A position detection method that detects the position of a moving object, said position detection method comprising:

an image acquisition process in which an image of the forward field of view of said moving object is acquired,

a distance image acquisition process having the same field of view as said image in which a distance image is acquired simultaneous to acquisition of said image,

a characteristic point extraction process in which respective characteristic points are acquired from the images of at least two consecutive frames, and

a reference characteristic point selection process in which the amount of displacement of a position between two frames of a characteristic point extracted in said characteristic point extraction process is calculated based on said distance image, and a reference characteristic point for calculating position according to said amount of displacement is selected.

7. A position detection method that detects the position of a moving object, said position detection method comprising:

an image acquisition process in which an image within the forward field of view of said moving object is acquired,

a reference point determination process in which a reference characteristic point to serve as a reference during movement of said moving object is determined based on said image, and

a position detection process in which position is detected by substituting self-movement control and the observed amount of said reference point into an extended Kalman filter.

8. A position detection method that detects the position of a moving object, said position detection method comprising:

an image acquisition process in which an image of the forward field of view of said moving object is acquired,

a distance image acquisition process having the same field of view as said image in which a distance image is acquired simultaneous to acquisition of said image,

a characteristic point extraction process in which respective characteristic points are extracted from obtained images, and

a reference characteristic point selection process in which pre-stored object information is compared with extracted characteristic points, and those characteristic points having a high correlation are considered to be known characteristic points that are used as reference characteristic points for calculating position.

9. The position detection method according to claim 8 wherein, said characteristic point selection process updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in

an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

10. A position detection method that detects the position of a moving object, said position detection method comprising:

an image acquisition process in which an image of the forward field of view of said moving object is acquired,

a characteristic point group extraction process in which a characteristic point group in said image is extracted, and

a position detection process in which position is calculated by correlating and storing multiple characteristic point groups in an image pre-obtained in said image acquisition process with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.

11. A position detection program for detecting the position of a moving object, said position detection program comprising performing by computer:

image acquisition processing in which an image of the forward field of view of said moving object is acquired,

distance image acquisition processing having the same field of view as said image in which a distance image is acquired simultaneous to acquisition of said image,

characteristic point extraction processing in which respective characteristic points are acquired from the images of at least two consecutive frames, and

reference characteristic point selection processing in which the amount of displacement of a position between two frames of a characteristic point extracted in said

characteristic point extraction processing is calculated based on said distance image, and a reference characteristic point for calculating position according to said amount of displacement is selected.

12. A position detection program for detecting the position of a moving object, said position detection program comprising performing by computer:

image acquisition processing in which an image within the forward field of view of said moving object is acquired,

reference point determination processing in which a reference characteristic point to serve as a reference during movement of said moving object is determined based on said image, and

position detection processing in which position is detected by substituting self-movement control and the observed amount of said reference point into an extended Kalman filter.

13. A position detection program for detecting the position of a moving object, said position detection program comprising performing by computer:

image acquisition processing in which an image of the forward field of view of said moving object is acquired,

distance image acquisition processing having the same field of view as said image in which a distance image is acquired simultaneous to acquisition of said image,

characteristic point extraction processing in which respective characteristic points are extracted from obtained images, and

reference characteristic point selection processing in which pre-stored object information is compared with extracted characteristic points, and those characteristic

points having a high correlation are considered to be known characteristic points that are used as reference characteristic points for calculating position.

14. The position detection program according to claim 13 wherein, said characteristic point selection processing updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

15. A position detection program for detecting the position of a moving object, said position detection program comprising performing by computer:

image acquisition processing in which an image of the forward field of view of said moving object is acquired,

characteristic point group extraction processing in which a characteristic point group in said image is extracted, and

position detection processing in which position is calculated by correlating and storing multiple characteristic point groups in an image pre-obtained in said image acquisition processing with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.